

of the south-west monsoon, vessels can run for shelter into their midst, and once there are as safe as when inside a breakwater. If the surface is so still, of course so is the water below, and such spots seem to be well suited to the siluroid fishes. These curious patches of sea which appear in a continually perturbed state, and the sea-bottom in the locality, would probably well repay careful scientific observation.

THE manufacture of isinglass, generally supposed to be confined to Russia and North America, or other countries where the sturgeon is found in abundance, is carried on to a considerable extent in India, principally from the air-vessels of several varieties of acanthopterygian fishes, and particularly, different kinds of perch, as well as from other fish. There is room for a great extension of the trade, as isinglass, the purest known form of animal jelly, has, in a measure, had its consumption checked by its high price, and substitutes are employed, such as gelatine, of which it is itself the purest form.

At the last meeting of the British Association a committee was appointed to investigate the circulation of the underground water in the New Red Sandstone and Permian Formations of England, and the quantity and character of the water supplied to the various towns and districts from these formations. Prof. Hull, M.A., F.R.S., director of the Geological Survey of Ireland, is chairman, and Mr. C. E. de Rance, F.G.S., Scientific Club, 7, Saville Row, London, W., secretary. The following queries have been circulated by the committee for the purpose of eliciting information in connection with the important subject:—1. *Position* of well, or wells, with which you are acquainted. 2. Approximate *height* of the same above the mean sea level. 3. *Depth* from surface to bottom of shaft of well, with diameter. *Depth* from surface to bottom of bore-hole, with diameter. 4. Height at which water stands *before* and *after* pumping. Number of hours elapsing before ordinary level is restored, after pumping. 5. *Quantity* capable of being pumped in gallons per day. 6. Does the *water level* vary at different seasons of the year, and how? Has it diminished during the last ten years? 7. Is the ordinary *water level* ever affected by local rains, and if so, in how short a time? And how does it stand in regard to the level of the water in the neighbouring streams, or sea? 8. *Analysis* of the water, if any? Does the water possess any marked *peculiarity*? 9. Nature of the rock passed through, including cover of drift, with *thicknesses*. 10. Does the cover of drift over the rock contain *surface springs*? 11. If so, are they entirely kept *out* of the well? 12. Are any large *faults* known to exist close to the well? 13. Were any *salt springs* or brine wells passed through in making the well? 14. Are there any *salt springs* in the neighbourhood? 15. Have any wells or borings been discontinued in your neighbourhood, in consequence of the water being more or less *brackish*? If so, if possible, please give section in reply to query No. 9.

WE have received, among the results of the geographical and geological explorations of the Western (U.S.) States, the annotated list of the birds of Utah, by Mr. H. W. Henshaw, containing the names of 214 species, of which 160 were either taken or noted in the expedition. The author thinks that if collections were, as they have not yet been, made during the spring months, several extra species would have to be added to the collection.

COAL is beginning to attract attention in New South Wales, in some parts of which the mineral is being found in abundance, and the pre-eminence which gold and copper have maintained will be assailed by the increasing importance of the newly worked product. A seam, seven feet thick, has been opened at Broughton Creek, near the Shoalhaven River, and not far from the Moss Vale Railway Station; so that every circumstance of locality is in favour of its profitable working.

THE *American Chemist* for August and September, which we

have just received, contains a full account of the proceedings at the Priestley Centenary in Northumberland, Pa., on July 31 last. There was then a large and enthusiastic gathering of men of science and others, and several valuable addresses were given. The principal one in the numbers before us is by Prof. B. Silliman, being a long, minutely detailed, and carefully compiled paper on "American Contributions to Chemistry."

WE are gratified to see that the *Geographical Magazine* has been so successful that the price is to be reduced to one shilling.

THE additions to the Zoological Society's Gardens during the past week include a Chamois (*Rupicapra tragus*) from the Pyrenees, presented by Mr. A. Wilson; a White-fronted Capuchin (*Cebus albifrons*) from South America, presented by Mrs. Carpenter; a common Boa (*Boa constrictor*) from South America, presented by Capt. E. C. Kemp; two Barred-tailed Pheasants (*Phasianus reevesii*) from North China, received in exchange.

ON THE STRUCTURE OF STIGMARIA *

AT a meeting of the Manchester Literary and Philosophical Society, held on October 20, Mr. Binney called in question some conclusions at which I had arrived and had published in Part II. of my memoirs on the Structure of the Coal Plants, respecting the organisation of Stigmara. Mr. Binney further published an abstract of his remarks in Part II. of vol. xiv. of the Society's Proceedings. Believing that Mr. Binney's observations, if allowed to pass unnoticed, may mislead some palaeontologists unacquainted with Stigmara, I feel called upon to reply to them through the same channel as that which he has employed for their promulgation. The general features of the plant known for half a century as *Stigmara ficoides* have been so well described by Lindley and Hutton, Dr. Hooker, Mr. Binney, and Brongniart, that no one familiar with those descriptions can fail to recognise it without difficulty. That plant consisted of a central medulla, surrounded by a cylinder of scalariform vessels arranged in radiating wedges, very distinctly separated by two kinds of medullary rays (primary and secondary), the whole being enclosed in a thick bark, from the surface of which spring numerous large cylindrical rootlets. The vascular cylinder gives off numerous large vascular bundles of scalariform vessels, which proceed outwards, through the conspicuous primary medullary rays, to reach the rootlets.

The dispute between Mr. Binney and myself resolves itself chiefly into three points: (1), the structure of the medulla of Stigmara; (2), the source whence the vascular bundles supplying them are derived; and (3), the nature of some vascular bundles which both Mr. Binney and M. Goepfert have figured as existing within the medulla, and one of which is prolonged radially in M. Goepfert's example through a medullary ray. Mr. Binney and M. Goepfert believe that the cellular medulla of Stigmara contained bundles of very large scalariform vessels, and that those bundles proceeded outwards to supply the rootlets. On the other hand, in my second memoir, referred to by Mr. Binney, I not only expressed my conviction, but demonstrated the absolute certainty, that such was not their origin. I adhere to the same opinion as I previously expressed, and have the specimens on the table which prove its correctness. The fact that these bundles were derived not from the medulla, but from the vascular wedges of the woody cylinder, was illustrated by the figures 43, 44, and 47 of the memoir referred to, figures which accurately represent, not conditions occasionally met with, but those which characterise every specimen of the true *Stigmara ficoides*. In the memoir I further affirm that immediately within the woody cylinder there exists a delicate cellular tissue, and state that one of my specimens makes it perfectly clear that the entire medulla consisted of similar cells, unmixed with any vascular bundles whatever such as were represented in M. Goepfert's and Mr. Binney's figures, and the accuracy of which is, was, and it appears still is, endorsed by Mr. Binney. After thus endorsing what I believe to be a grave mistake, Mr. Binney proceeds to justify his doing so by appealing to a specimen which I have not seen, but which Mr. Binney's own description convinces me is a plant altogether different alike from the Stigmara of authors, and from M.

* A paper read before the Manchester Philosophical Society, by Prof. W. C. Williamson, F.R.S., Nov. 17.

Goeppert's and Mr. Binney's own figures. Mr. Binney's describes his new specimen as having a radiating woody cylinder, immediately within which is a second series of large vessels not arranged in radiating wedges, and which Mr. Binney says is "something like a medullary sheath, enclosing a medulla composed of very small and short barred tubes or utricles, in which are mingled large vascular tubes or utricles." Though this use of vague terms renders the sense obscure, I presume that Mr. Binney simply means that in the medulla of his plant a vascular cylinder encloses a cellular medulla, or, in other words, that his specimen has a Diploxyloid axis. That Mr. Binney possesses a specimen having the above structure, and giving off rootlets from its periphery, I have no reason for doubting, since in the memoirs already quoted I have described a similar structure under the name of *Diploxyton stigmarioideum*, and respecting which I make the following observations:—"It is possible that the plant may, like *Stigmaria*, prove to be the uppermost part of a root of some of the other forms" (*i.e.* of *Lepidodendroid* stems), "though I have never yet found it associated with any rootlets, and it may be a fragment from the base where stem and roots united" (*loc. cit.* p. 239). I arrived at the above conclusions because I found in the specimen described, evidence that large rootlet bundles were given off from the woody zone as in the true *Stigmaria*. But I affirm that out of hundreds of *Stigmarian* fragments that I have examined, I have only found two possessing this structure, and I unhesitatingly express my conviction that Mr. Binney's specimen is another example of an equally rare type, both being entirely distinct from *Stigmaria ficoidea*, to which latter plant alone is referable Mr. Binney's previously published figures, M. Goeppert's description and figures of which Mr. Binney approves, and mine which he rejects.

Mr. Binney proceeds to say: "The size of these large vascular tubes or utricles in the medulla exceeding anything so far as his knowledge extended, hitherto observed in fossil plants, shows that it was easily decomposed, and thus accounts for the general absence of the medulla in *Sigillaria* and its roots." To this reasoning I must altogether demur. Size has nothing whatever to do with the preservation of the tissues in fossil plants. Vascular structures strengthened by transverse bars of lignine are equally well preserved, whether they are large or small. The medulla of *Stigmaria* disappeared or became much disorganised because it consisted of an unusually delicate cellular tissue with extremely thin walls. This tendency to decay was more manifest towards the centre of the medulla than at its circumference. Specimens on the table exhibit this peripheral part of the cellular medulla in exquisite perfection, giving off its characteristic cellular prolongations constituting the medullary rays, as described in my memoir. And yet this beautiful cellular tissue occupies the position which Mr. Binney says was occupied by "large vascular tubes or utricles." The specimens referred to showing these conditions constitute unanswerable facts.

Mr. Binney correctly notes the resemblance of the inner vascular cylinder in his specimen to his "medullary sheath." I have already said the same thing in several of my memoirs, and M. Brongniart said it before either of us. But this very homology, if correct, indicates the probability of Mr. Binney's specimen being a fragment derived from the junction of stem and root rather than a true root, since in living plants possessing a medullary sheath, that sheath, as every botanist knows, is never prolonged into the true roots, for the simple physiological reason that its origin is directly connected with that of the leaf formations of the ascending axis.

As I have already observed, M. Goeppert's and Mr. Binney's previous figures represent a structure altogether different from that now described by Mr. Binney. Instead of the continuous inner vascular cylinder of the latter, M. Goeppert's figure displays two detached, unsymmetrically arranged, vascular bundles in the interior of the medullary cavity. I have already affirmed my conviction that these belong to intruded rootlets of a *Stigmaria*, and are in no respects part of the true medullary axis. On the other hand, Mr. Binney says that "they are certainly not intruded rootlets, as anyone who examines the learned author's plates can satisfy himself." On this point Mr. Carruthers writes to me on Nov. 2: "No one who is accustomed to sections of *Stigmaria* can fail to see that Goeppert has mistaken the accidental rootlets of *Stigmaria* penetrating the decayed axis for an organic part of that axis." I may allow this opinion of an experienced botanist, with which I wholly concur, to neutralise that of Mr. Binney, who further says: "It is very improbable that they" (*i.e.*, Goeppert's vascular rootlets) "had ever been introduced into

the axis after the pith had been removed." To this I reply that it is an extremely rare thing to find any such axis which does not contain more or less of these rootlets. My cabinet is full of such examples, and in two specimens on the table, one of which has been lent me by Capt. J. Aitken, of Bacup, similar rootlets not only exist in the central axis, but have penetrated the medullary rays as in M. Goeppert's specimen.

Mr. Binney, referring to my comments upon his previous memoir, says that in "that memoir mention is only made of the large vascular bundles found in the axis, without calling them vascular or any other vessels." I do not very clearly understand what this sentence means, but I presume it is intended to imply that Mr. Binney never affirmed that the pith of *Stigmaria* contained vascular tissues, and that I have misrepresented him in stating that he had done so. I can only answer this by giving Mr. Binney's words:—"The most important circumstance thus developed is the existence of a double system of vessels in *Stigmaria*, first shown by Goeppert, and the consequent approach in this respect to *Diploxyton*, *Corda*. In *Diploxyton*, however, the inner system forms a continuous cylinder, concentric with and in juxtaposition to the wedges of wood forming the outer; while in *Stigmaria* the same inner system is broken up into scattered bundles, apparently unsymmetrically arranged in the medullary axis or pith of the plant" (*Quarterly Journal of the Geological Society*, vol. xv. p. 17); and on p. 78 of the same memoir, describing the specimen represented by Fig. 2, he says, "The axis is filled with eleven or twelve large vessels of circular or oval form," and the same structures are again spoken of as "vessels" no less than six times in the next seventeen lines, with the further remark that "altogether these angular vessels remind me somewhat of the vascular tissue in the middle of *Anabathra*" (*loc. cit.*, p. 78). It is true that in two places Mr. Binney applies to these structures the term "utricles," by which, I presume, he means cells; but such a term, applied to such tissues, is equally applicable to all known fibro-vascular structures, and is simply equivalent to saying that scalariform vessels have no existence.

I have entered into these details because by promulgating vague and groundless doubts respecting work already carefully done, Mr. Binney's communication tends to re-introduce confusion into questions that have been virtually settled. It does this through failing to discriminate between things that differ. His introductory remarks refer to the common *Stigmaria ficoidea*, whilst his justification of those remarks rests upon a plant of a very different character, and which I am absolutely certain is not the common form of *Stigmaria*.

VEGETATION OF THE LIBYAN DESERT

IN Dr. Ascherson's report on the vegetation of the Libyan Desert, published in the *Botanische Zeitung*, there are some interesting notes on the fall and renewal of the leaves of deciduous trees. In our climate we have little difficulty in understanding the distinction between evergreen and deciduous trees and shrubs, because the greater part of those that change their leaves cast the old ones in autumn or early winter; and evergreens with flat leaves have them more or less coriaceous. But even with us there is a gradual transition from evergreen to deciduous through *Eunonymus europæus* and *Ligustrum vulgare*, both of which have strictly evergreen congeners in *Eunonymus japonicus* and *Ligustrum japonicum*. Some few years ago Hoffmann started a theory that sempervirence could be artificially produced, and there is no doubt that climate influences to a great extent the length of the period during which really deciduous species hold their foliage; but it appears far more probable that these are physiological peculiarities not altogether dependent upon climate, as we find evergreen and deciduous species growing in the same regions and under precisely similar conditions. Some evergreens do not change their leaves at all, and even retain them for many years or all their lifetime; *Araucaria imbricata*, for example. *Taxodium distichum*, one of the few deciduous Coniferae, offers a very curious phenomenon, inasmuch as the ultimate branchlets are deciduous. The observations chronicled by Dr. Ascherson agree almost entirely with our own experience. On his outward journey he traversed 25° of lat. in less than a month, which gave him an excellent opportunity for studying the conditions of the same species under very diverse climates. Thus, in the plains of Lombardy many deciduous trees, and especially *Morus alba*, were still partially covered with foliage on the 19th